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⑮ 発明の名称 音声デジタル記憶、再生方法及び装置

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## 明 細 書

### 1. 発明の名称

音声デジタル記憶、再生方法及び装置

### 2. 特許請求の範囲

(1) マイクロホン又はオーディオ機器から出力されるアナログ音声信号をデジタル音声信号に変換して半導体メモリにデジタル的に記憶し、前記半導体メモリからデジタル音声信号を呼び出しアナログ音声信号に変換して再生出力する音声デジタル記憶、再生方法。

(2) マイクロホン又はオーディオ機器から出力されるアナログ音声信号をサンプリング信号でサンプリングした後デジタル音声信号に変換するアナログ・デジタル・コンバータと、前記サンプリング信号とメモリ書き込み信号とを形成するメモリ書き込み制御装置と、前記アナログ・デジタル・コンバータから出力されるデジタル音声信号を前記メモリ書き込み信号に従ってデジタル的に記憶する半導体メモリと、前記半導体メモリに記憶されたデジタル音声信号を呼び出すメ

モリ呼び出し信号を外周からの指令で形成するメモリ呼び出し制御装置と、前記メモリ呼び出し信号で前記半導体メモリから呼び出されたデジタル音声信号をアナログ音声信号に変換するデジタル・アナログ・コンバータと、前記デジタル・アナログ・コンバータからのアナログ音声信号を音声として再生出力するスピーカ又はイヤホンとからなる音声デジタル記憶、再生装置。

### 3. 発明の詳細な説明

#### 〔産業上の利用分野〕

本発明は、音声をデジタル化して記憶し、それをアナログ化して再生出力する音声デジタル記憶、再生方法及び装置に関するものである。

#### 〔従来技術〕

従来の音声記憶、再生装置としては、アナログ音声信号をテープに記憶し、該テープからアナログ音声信号を呼び出して再生出力するテープレコーダがある。

## 【発明が解決しようとする問題点】

しかしながら、テープレコーダでは、音声の記憶、再生が頻繁な場合、機械構造部分の故障率が高い問題点がある。また、数多く音声を記憶している場合には、各音声の取出しに時間がかかる、テープの不良が発生し易い等の問題点がある。

本発明の目的は、頻繁に使用しても故障が少なく、各音声の取出しも時間をかけずに行うことができる音声デジタル記憶、再生方法及び装置を提供することにある。

## 【問題点を解決するための手段】

上記の目的を達成するための本発明の手段を実施例に対応する図面を参照して説明する。

本願の第1の発明は、マイクロホン1又はオーディオ機器2から出力されるアナログ音声信号をデジタル音声信号に変換して半導体メモリ5にデジタル的に記憶し、前記半導体メモリ5からデジタル音声信号を呼び出しアナログ音声信号に変換して再生出力するものである。

## 【作用】

このように音声をデジタル化して半導体メモリ5に記憶すると、記憶させまたは再生するための機構が簡単になり、頻繁に使用しても故障しにくくなる。また、デジタル化して半導体メモリ5に記憶すると、取出しも時間をかけずに行えるようになる。

## 【実施例】

以下本発明の実施例を図面を参照して詳細に説明する。図において1は音声をアナログ音声信号に変換するマイクロホン、2はアナログ音声信号を出力する各種オーディオ機器、3はアナログ音声信号をサンプリング信号でサンプリングした後デジタル音声信号に変換するアナログ・デジタル・コンバータ（以下、A/Dコンバータという）、4はサンプリング信号とメモリ書き込み信号とを形成するメモリ書き込み制御装置、5はA/Dコンバータ3でサンプリングされたデジタル音声信号をメモリ書き込み信号に従ってディ

ジタル的に記憶する半導体メモリである。半導体メモリ5としては、例えばランダムアクセスメモリ（RAM）やリードオンリーメモリ（ROM）等を用いる。6は半導体メモリ5に記憶されたデジタル音声信号を呼び出すメモリ呼出し信号を外からの指令で形成する論理回路又はマイクロコンピュータよりなるメモリ呼出し制御装置、7はメモリ呼出し信号で半導体メモリ5から呼び出されたデジタル音声信号をアナログ音声信号に変換するデジタル・アナログ・コンバータ（以下、D/Aコンバータという）、8はD/Aコンバータ7のアナログ音声信号を増幅する増幅器、9は増幅されたアナログ音声信号を音声として再生出力するスピーカ又はイヤホンである。

次にこのような装置を用いて行う音声デジタル記憶、再生方法について説明する。マイクロホン1又はオーディオ機器2から出力されるアナログ音声信号を、A/Dコンバータ3にてメモリ書き込み制御装置4からのサンプリング信号でサンプリングした後、デジタル音声信号に変換する。

次にこのような装置を用いて行う音声デジタル記憶、再生方法について説明する。マイクロホン1又はオーディオ機器2から出力されるアナログ音声信号を、A/Dコンバータ3にてメモリ書き込み制御装置4からのサンプリング信号でサンプリングした後、デジタル音声信号に変換する。

このデジタル音声信号は、メモリ書き込み制御装置4からのメモリ書き込み信号に従って半導体メモリ5に記憶させる。半導体メモリ5に記憶されたデジタル音声信号は、外部からの指令でメモリ呼出し制御装置6にて形成したメモリ呼出し信号により呼出し、D/Aコンバータ7でアナログ音声信号に変換し、増幅器8で増幅し、スピーカ又はイヤホンで音声として再生出力する。

【発明の効果】

以上説明したように本発明に係る音声デジタル記憶、再生方法及び装置では、半導体メモリに音声信号をデジタル化して記憶し再生するので、記憶させまたは再生するための機構の機械的可動部分がほとんどなくなり、従ってテープレコーダに比べて機構が著しく簡単になり、頻りに使用しても故障しにくくなる利点がある。また、本発明によれば、限られた文章等を高度な記憶装置を必要とせず、どこでも簡単に記憶させることができ、文章の頻りに放送、文章の繰り返し放送、文章の

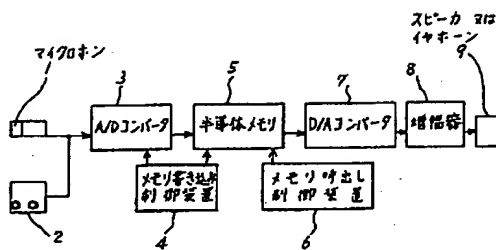
初め立て放送、及び言葉を話すメカトロニクス等を使用することができる。更に、音声信号をデジタル化して半導体メモリに記憶すると、面出しも時間をかけずに行える利点がある。

4. 図面の簡単な説明

図面は本発明に係る装置の一実施例を示すブロック図である。

1…マイクロホン、2…オーディオ機器、3…A/Dコンバータ、4…メモリ書き込み制御装置、5…半導体メモリ、6…メモリ呼出し制御装置、7…D/Aコンバータ、9…スピーカ又はイヤホン。

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- (74) Agent: Patent Attorney, Toshio NAKAO and another

#### SPECIFICATION

1. Title of the Invention: SEMICONDUCTOR-TYPE RECORDED  
SIGNAL PLAYBACK DEVICE

2. Claims

(1) A semiconductor-type recorded signal playback device, wherein a socket or box on which a semiconductor memory recording voice signals is mounted, a compact speaker for outputting voice signals read from the semiconductor memory, a battery for supplying a power supply voltage to the semiconductor memory and the speaker, and an operation unit for controlling playback of signals from the semiconductor memory are integrated, and wherein the device is configured in a shape of a hang-on-ear earphone or a headphone.

(2) A semiconductor-type recorded signal playback device, wherein a socket or box on which a semiconductor memory recording voice signals is mounted, a compact speaker for outputting voice signals read from the semiconductor memory, and a battery for supplying a voltage to the semiconductor memory and the speaker are integrated, and wherein the device is configured in a shape of a hang-on-ear earphone or a headphone and a read address of the semiconductor memory is externally controlled.

### 3. Detailed Description of the Invention

#### Industrial Field

The present invention relates to a semiconductor-type recorded signal playback device mainly used for a portable headphone stereo tape recorder or the like and particularly using a semiconductor memory.

#### Related Art

In a presently used headphone stereo tape recorder, a recording/playback unit and a headphone are separated from each other, a cassette tape is driven by a motor, and voice signals are read from the tape and are supplied to the headphone.

#### Problems to be Solved by the Invention

Accordingly, when a method of driving a cassette tape by a motor is used, possible miniaturization and light

weight are limited due to the size of the cassette tape and the weight of batteries (AA battery  $\times 2 = 40$  g). Also, a lead between a main body and a headphone is difficult to handle disadvantageously.

The present invention has been made to solve the above-described problems of the related art and is directed to provide a miniaturized and light-weighted device that does not need a lead.

#### Means for Solving the Problems

A recorded signal playback device of the present invention uses a semiconductor memory instead of a cassette tape so as to miniaturize the device by omitting a cassette tape, a motor, and large batteries (AA or the like), and is configured in a size that can be hang on an ear.

#### Operation

With the above-described configuration, the present invention has advantages that voice signals in the semiconductor memory can be read, amplified, and listened to, and that neither a lead nor heavy batteries need be used.

#### Embodiment

Hereinafter, an embodiment of the present invention is described with reference to the drawings. Fig. 1 (a), (b), and (c) show a semiconductor-type recorded signal playback device according to an embodiment of the present invention; and Fig. 2 shows a circuit thereof. Reference numeral 1R

denotes an open-air headphone to be hung on a right ear and reference numeral 3R denotes a compact speaker unit, a sponge is attached on its front surface. Reference numeral 2 denotes an ear arm (hereinafter referred to as an arm) used to hang the headphone 1R on a right ear. When headphones 1R and 1L are put on right and left ears, the arm 2 can be replaced by a spring for mechanically connecting the both headphones, so as to form a configuration of a so-called conventional headphone.

Reference numeral 4R denotes a semiconductor memory (ROM) recording right-side voice signals and reference numeral 5 denotes an indicator indicating a position in the ROM 4R (and 4L) where reading starts or where reading ends the indicator being formed of a liquid crystal display. Reference numeral 6 denotes a keyboard composed of keys used to input control information, such as a range in the ROMs 4R and 4L to be read. Main components provided inside the headphone 1R includes, as shown in Fig. 2, the ROM 4R, the speaker unit 3R (including a filter and an amplifier), a small battery 8R, and a playback control unit 7. On the other hand, the headphone 1L to be hung on a left ear includes a read address control unit 9 instead of the playback control unit 7. The ROM 4L, a speaker unit 3L, and a battery 8L are the same as in the right headphone 1R.

Hereinafter, an operation is described.

First, a "P" key 6P in the keyboard 6 is pressed and a three-digit value is input so as to specify a reading start address. Then, a "Δ" key 6a is pressed and a three-digit value is input so as to specify a reading end address. The ROM should be sufficiently divided into 1000 addresses. Then, pressing a "v" key 6b causes a waiting state for input of an address to be read next. That is, end of inputting a reading start address is specified by the "Δ" key 6a and end of inputting a reading end address is specified by the "v" key 6b. For example, when a user wants to listen to only one song repeatedly, the user inputs a start address (e.g., "123") and an end address (e.g., "247"), presses an "R" key 6R, and then presses a playback starting "S" key 6S. Accordingly, the same song is repeatedly played back continuously. An "E" key 6E is pressed to stop playback.

With the above-described configuration, the semiconductor-type recorded signal playback device can be realized. In Fig. 2, a lead 10 connecting the right and left headphones 1R and 1L may be composed of two lines including an earth if only a line to transmit addresses in series is provided. No problem occurs even when the lead 10 is provided along a spring holder supporting the headphones 1R and 1L. Also, no problem occurs in use even when the both headphones have a configuration to be hung on an ear and they are connected by two leads. By limiting signals

transmitted through the lead 10 to three types: a start address; start playback; and end playback, and by transmitting timing pulses at predetermined intervals, addresses of the ROMs 4R and 4L change at the same time. The address control unit 9 includes a preset counter and a data code detecting circuit. By constituting the circuit element shown in Fig. 2, except the battery and speaker unit, with a CMOS, by using a digital filter as a filter in the speaker unit 3, by reducing power consumption, by increasing efficiency of the speaker unit, and by suppressing a maximum output, continuous playback of about a few hours to ten hours can be performed only by supplying an AAA battery on each of the right and left sides. Since an address can be freely set, an order of songs and a number of times can be set more freely compared to a cassette tape.

Next, in view of time required to store data in a semiconductor memory by using a current technique, a mask ROM of 1 M bit and a DRAM of 1 M bit have been practically used. In the near future, a DRAM (or an SRAM of a CMOS) of 20 to 30 M bits will be produced by extending the current technique. On the other hand, various methods are used to digitally record voice, but it is estimated that music of a quite high sound quality can be realized in a  $\Delta$ PCM of about 11 bits.

Assuming that a sampling rate is 20 KHz, a maximum

frequency component is 10 KHz, where a sound quality is equivalent to that in a headphone stereo using a normal cassette tape. When sampling is performed at 20 KHz at 11 bits, 220 K bits are required for each second, and recording can be performed for 100 seconds in a ROM of 22 M bits. If a memory is designed at  $2^n$  times of 1 M bit, 16 M bits are obtained and the number of bits is  $1.024 \times 2^{14} = 16,777,216$  bits, and recording time is about 76.26 seconds. If two chips of 16 M bits are incorporated as the ROMs 4R and 4L, recording time is 152.5 seconds, that is, 2.5 minutes. This is equivalent to 5 minutes in a monophonic mode. In conversation or the like, a sufficient sample rate is 10 KHz and a sufficient bit number of  $\Delta$ PCM is 10 bits. Therefore, recording time is 167.8 seconds at 16 M bits, 335 seconds (about 5.7 minutes) when using two chips, and 11 minutes in a monophonic mode when using both ears. The memory capacity can increase by 1 to 2 digits by a technological innovation in the future. If the memory capacity increases by 1 digit, 160 M bits  $\times$  2 is included in one ROM as described above, so that music of about 25 minutes can be recorded. This time period is almost equal to that of one side of an LP record. In English conversation or the like, only one headphone 1R may be used. Assuming that a maximum capacity of one chip in a memory is 16 M bits, recording time is about 5.7 minutes, which is long enough in a case where an English

listening exercise is performed while walking or on a vehicle. Even when a user wants to listen to the data repeatedly, the user only has to set a program once at first.

Fig. 1a shows the headphone 1R viewed from a side, in which the ROM 4R is in a state of being inserted into the main body from a direction vertical to the paper plane.

With this configuration, an estimated weight put on an ear is about 90 g or less in total: one AAA battery is about 17 g; a conventional headphone unit is about 20 g; and the sum of a ROM, an IC of a control circuit, and an exterior is about 50 g or less. This configuration is sufficiently practical.

Next, details of the speaker units 3R and 3L are additionally described. In Fig. 3, the speaker unit 3R is the same as the speaker unit 3L. Therefore, only the speaker unit 3R is described here. In the figure, reference numeral 10 denotes a decoder for a  $\Delta$ PCM signal, the configuration thereof being known. Reference numeral 11 denotes a low-pass filter to remove noise of digital signals. The low-pass filter 11 may be a digital filter without using L and C. Reference numeral 12 denotes a low-power amplifier of about 10 mW or less, and reference numeral 13 denotes a compact speaker.

In the above description, each circuit is operated at 1.5 V. However, no problem occurs even when the voltage is

increased by using an oscillator. Each circuit may be an IC, but a micro processor may also be used. Additionally, the components except the power amplifying speaker units 3L and 3R may be operated by a lithium battery (button type) as in an electronic calculator.

As described above, according to this configuration, voice signals recorded in a semiconductor are played back. Accordingly, a cassette tape and a motor are not required and a lead connecting a headphone and a cassette tape player is not required. As a result, miniaturization and light weight can be realized and the handling becomes easy.

#### Advantages

As described above, according to the present invention, a semiconductor memory, a memory control circuit, and a battery are accommodated in the same casing and a configuration of a hang-on-ear headphone is adopted. With this configuration, a lead between the headphone and a player for playing back recorded signals is not required and data can be randomly played back by utilizing the characteristic of the semiconductor memory.

#### 4. Brief Description of the Drawings

Fig. 1 shows an appearance of a semiconductor-type recorded signal playback device according to an embodiment of the present invention; Fig. 2 is a block diagram of an

electrical connection of the device; and Fig. 3 is a block diagram for illustrating an operation of a main part of the device.

1R, 1L ... headphone, 2 ... ear arm, 3R, 3L ... speaker unit, 4R, 4L ... semiconductor memory, 5 ... liquid crystal display unit, 6 ... keyboard, 7 ... playback control unit

Name of agent: Patent Attorney, Toshio NAKAO and  
another

FIG. 1

1R: HEADPHONE  
2: EAR ARM  
3R: SPEAKER UNIT  
4R: SEMICONDUCTOR MEMORY  
6: KEYBOARD

FIG. 2

3R: SP AMP (RIGHT)  
3L: SP AMP (LEFT)  
4R: ROM (RIGHT)  
4L: ROM (LEFT)  
7: PLAYBACK CONTROL UNI  
8R: SMALL BATTERY (AAA × 1)  
8L: SMALL BATTERY (AAA × 1)  
9: ADDRESS CONTROL UNIT

FIG. 3

10: ΔPCM DECODER  
11: LOW-PASS FILTER  
12: LOW-POWER AMPLIFIER